Demonstrating a Secure, Reliable, Low-Carbon Community Microgrid

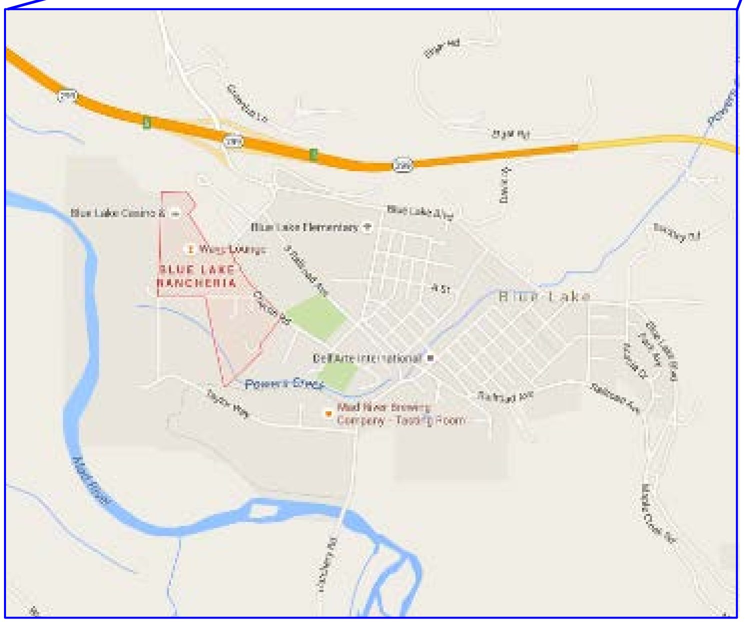
at the Blue Lake Rancheria

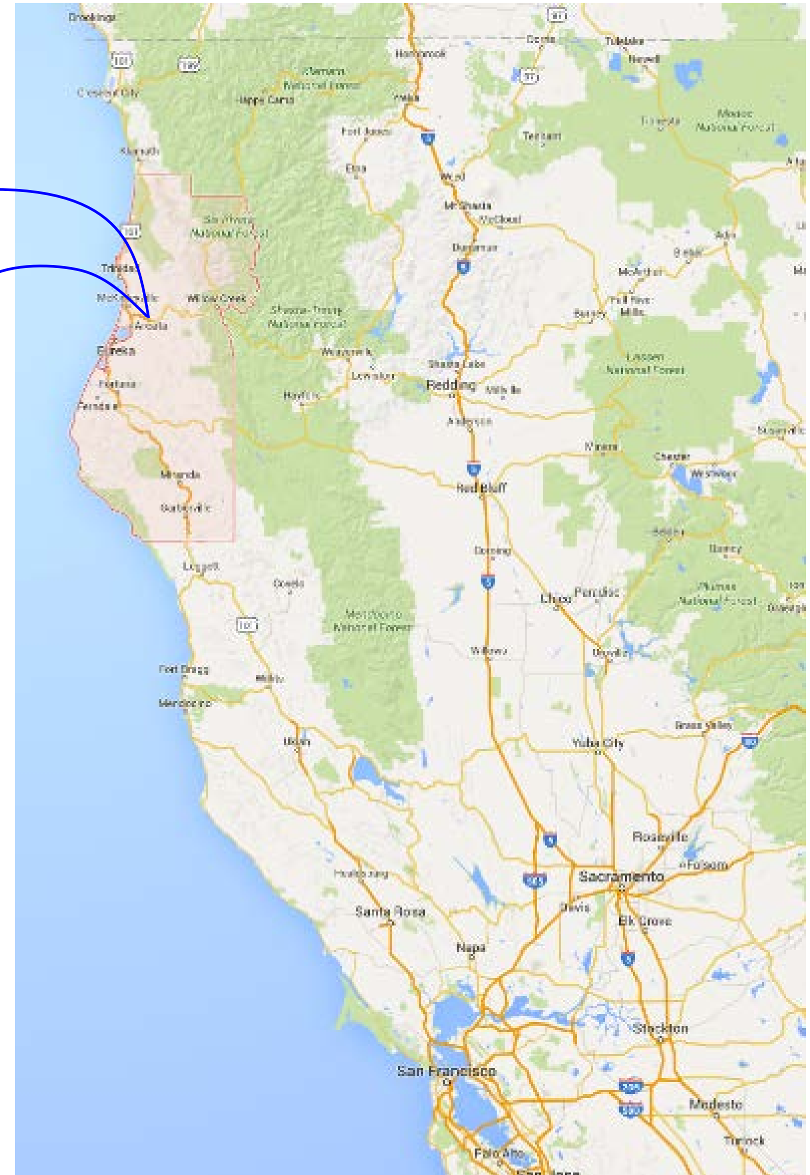
Microgrid Workshop, September 6, 2016
California Energy Commission, Sacramento, CA
Electric Program Investment Charge Award No. EPC-14-054

Outline

- Background
- Project Description
- Project Implementation
- Project Status
- Evaluation Metrics & Project Benefits
- Lessons Learned

Location

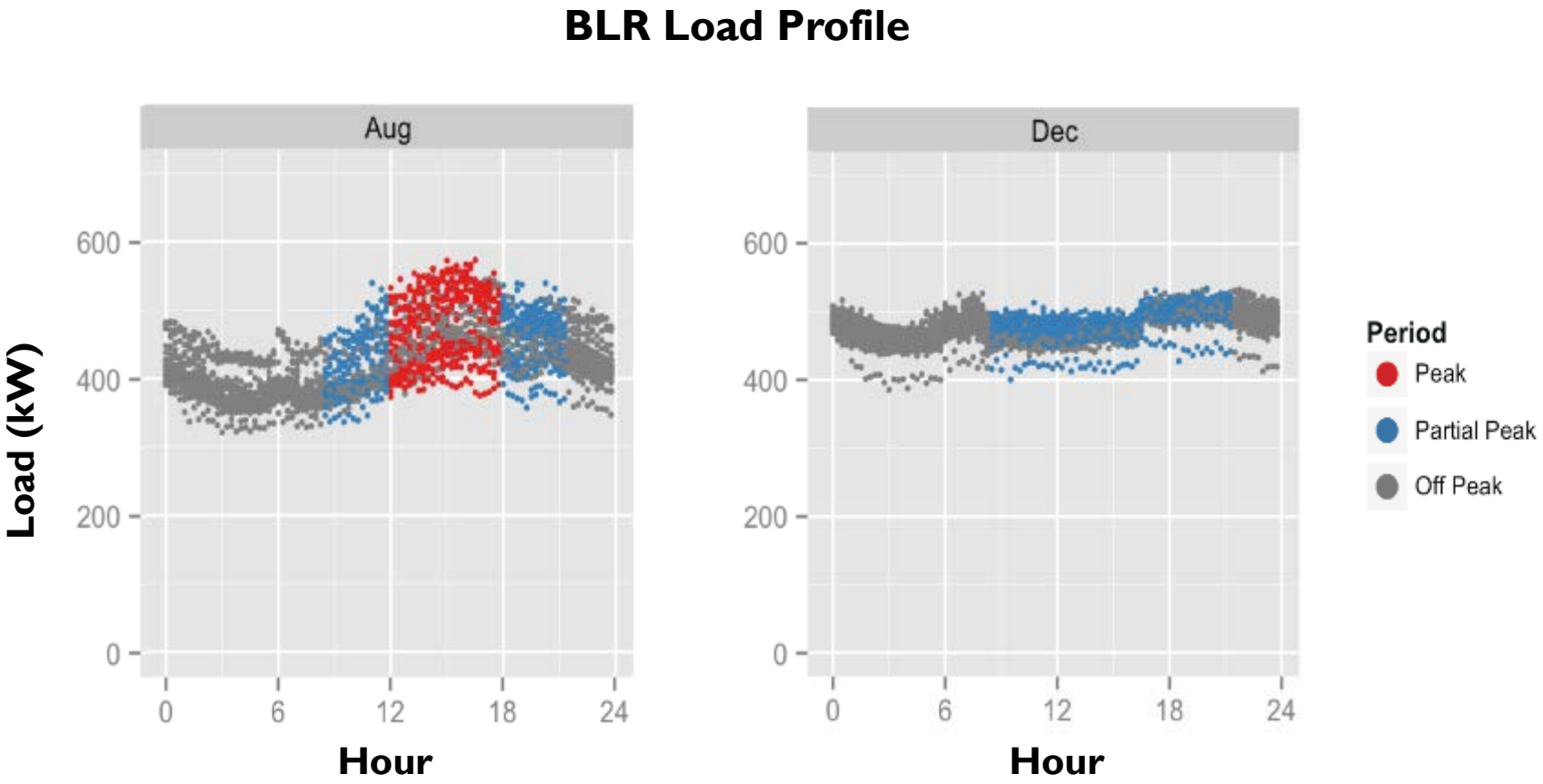

BLUE LAKE RANCHERIA
Blue Lake
Blue Lake Casino &
Blue Lake Elementary
Dell'Arte International
Powers Creek
Mad River Brewing Company - Tasting Room


Eureka
Arcata
Redding
Red Bluff
Chico
Yuba City
Roseville
Folsom
Sacramento
Davis
Elk Grove
Santa Rosa
Napa
Stockton
San Francisco
Modesto
Palo Alto
San Jose

Background

- Natural disaster prone region
- Energy resiliency important
- Regional hazard mitigation planning
- American Red Cross critical support facility
- Experienced, committed local project partners

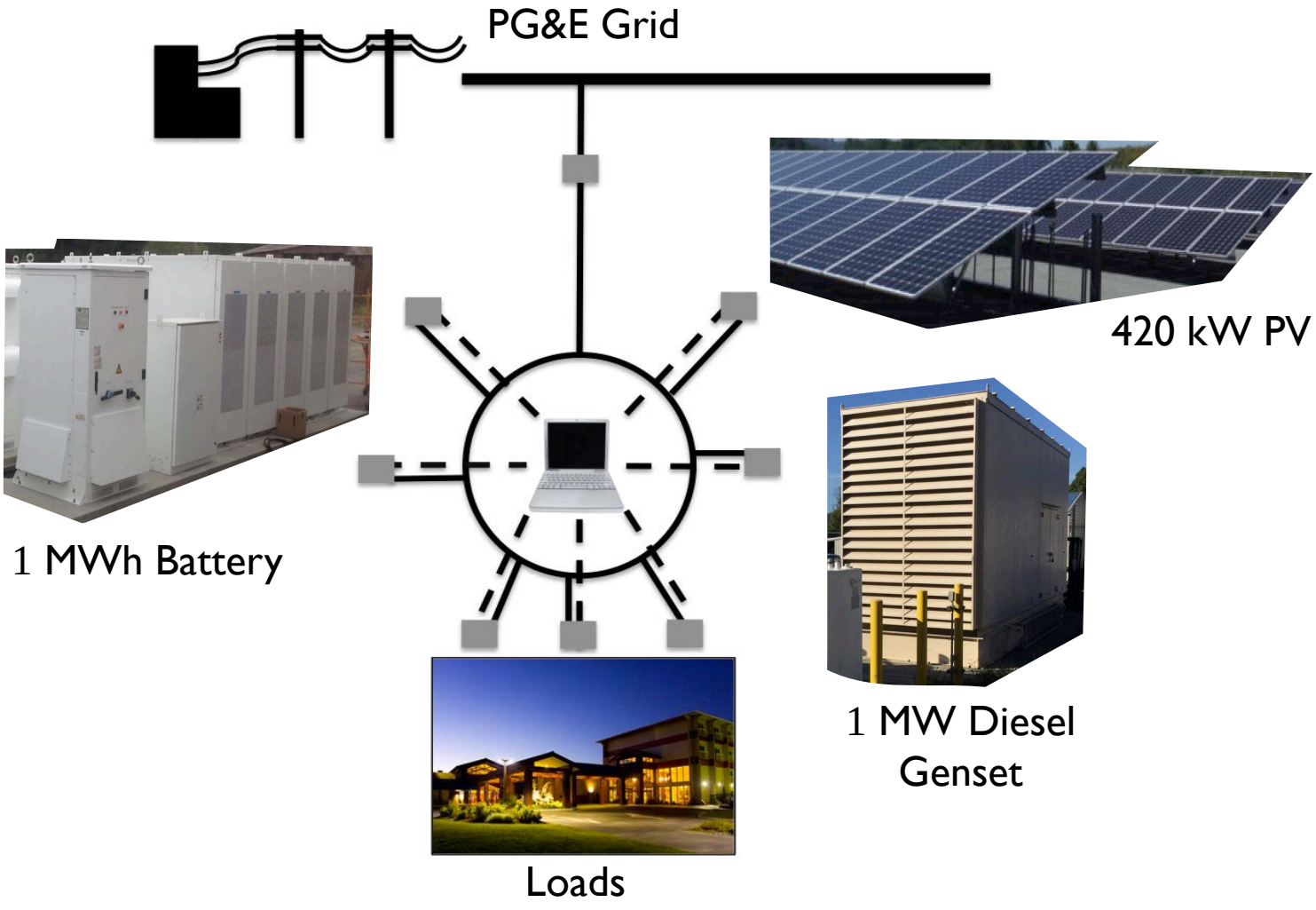
Background


BLR Load Profile
Aug
Dec
Load (kW)
600
400
200
0
0
6
12
18
24
Hour
Period
Peak
Partial Peak
Off Peak

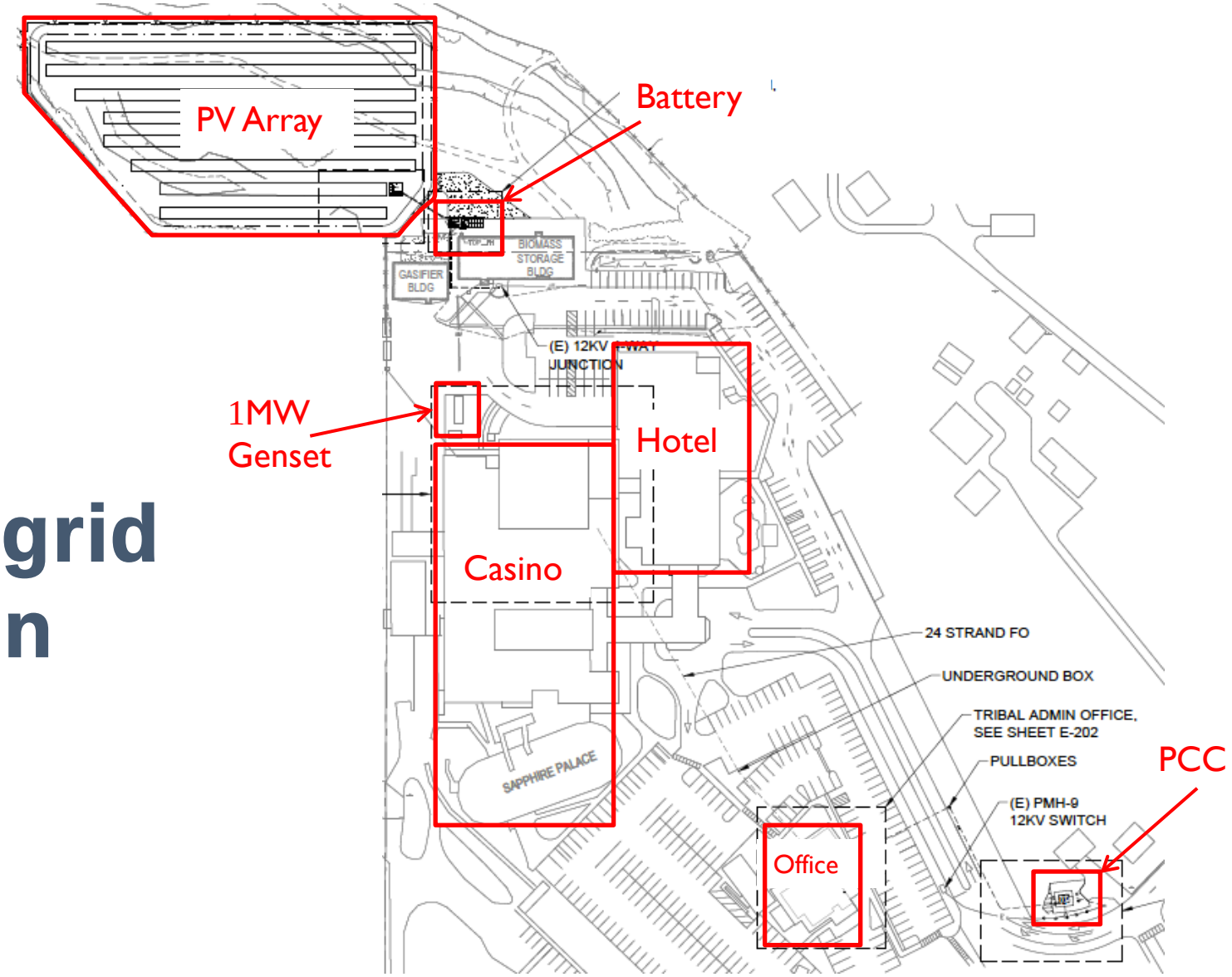
Key Partners

- Schatz Energy Research Center
- Blue Lake Rancheria
- Idaho National Laboratory
- GHD
- Robert Colburn Electric
- Kernen Construction
- Pacific Gas & Electric
- SIEMENS
- Tesla Motors
- REC Solar

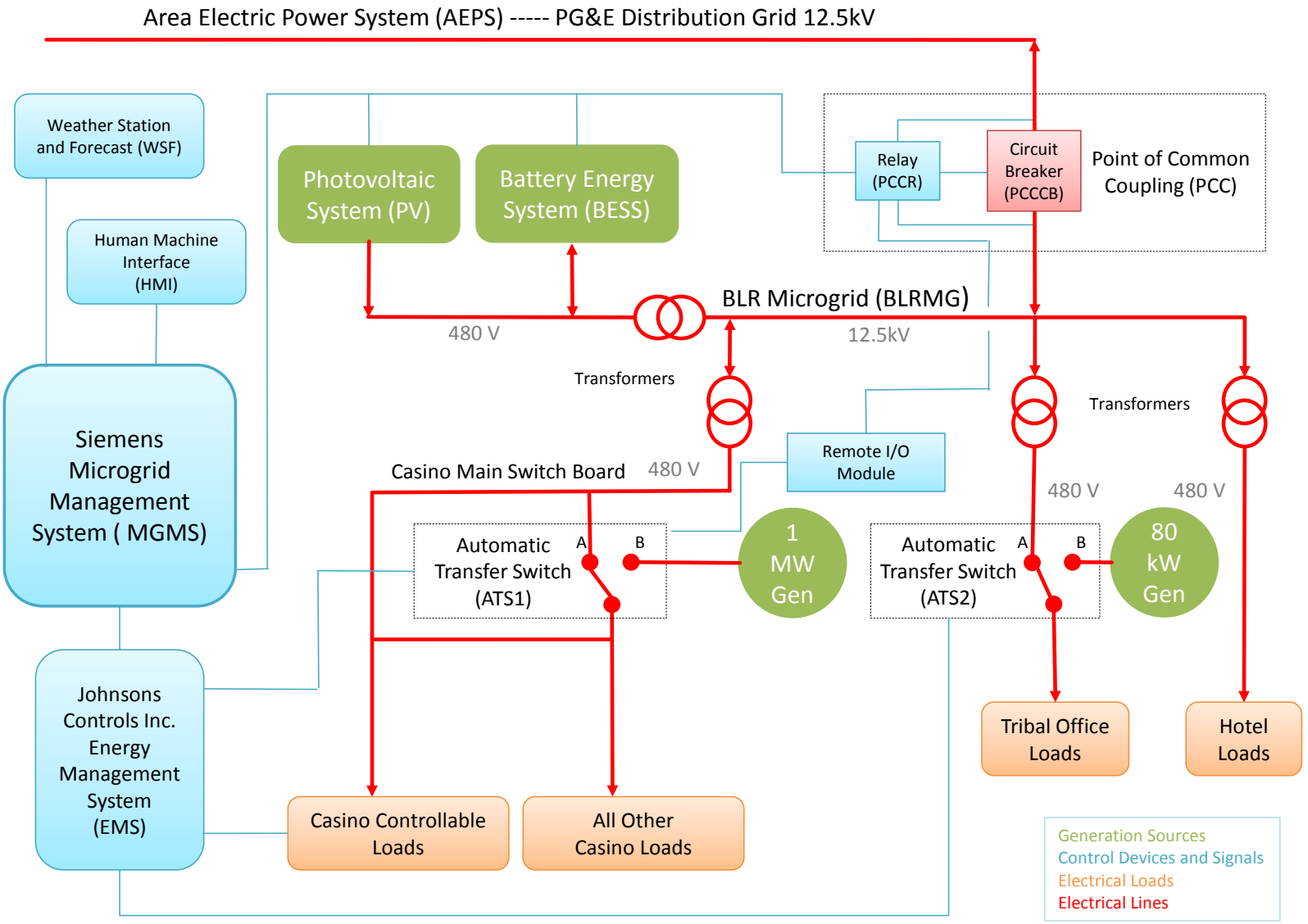
Microgrid Design



Microgrid Design



Microgrid Design - Simplified Schematic



PV Array

Battery

PCC Switchgear

Implementation

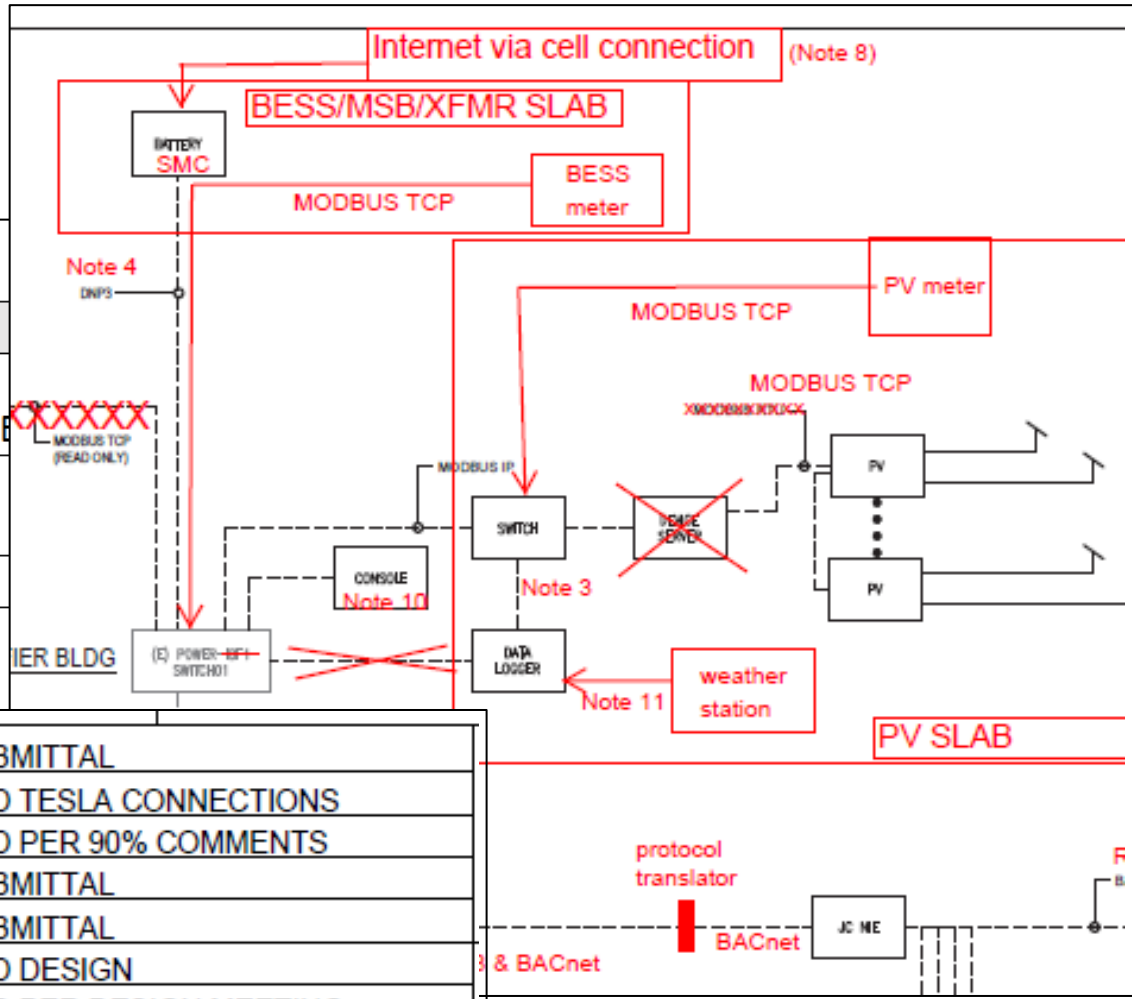
- Collaborative Design-Build Approach
- Integrated Design Plan Set
- Concept of Operations Document

Implementation

- Design Reviews:
- 50%, 90%, 95%

Revision History

Number	Date	Author(s)
[0]	January 8, 2016	D. Carter, D.Saucedo SE
[1]	January 15, 2016	D. Carter
[2]	January 26, 2016	G. Chapman
[3]	February 8, 2016	D. Carter



BAR IS ONE INCH
ON ORIGINAL DRAWING
0 1"

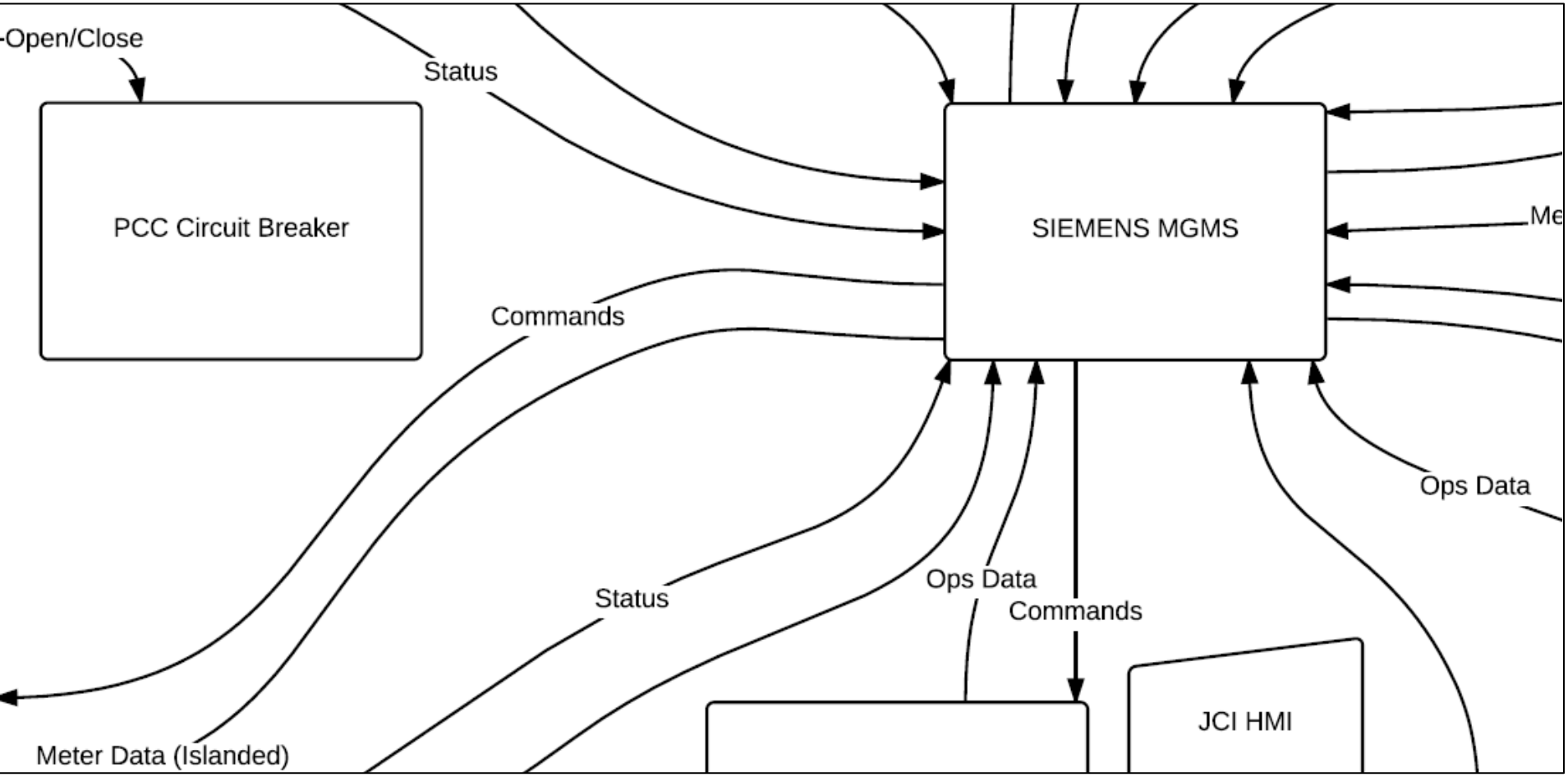
SCHATZ ENERGY RESEARCH CENTER

REV	DATE	DESCRIPTION
9	07/05/2016	95% SUBMITTAL
8	06/09/2016	REVISED TESLA CONNECTIONS
7	05/31/2016	REVISED PER 90% COMMENTS
6	05/06/2016	90% SUBMITTAL
5	12/31/2015	50% SUBMITTAL
4	12/18/2015	REVISED DESIGN
3	11/12/2015	REVISED PER DESIGN MEETING

Implementation

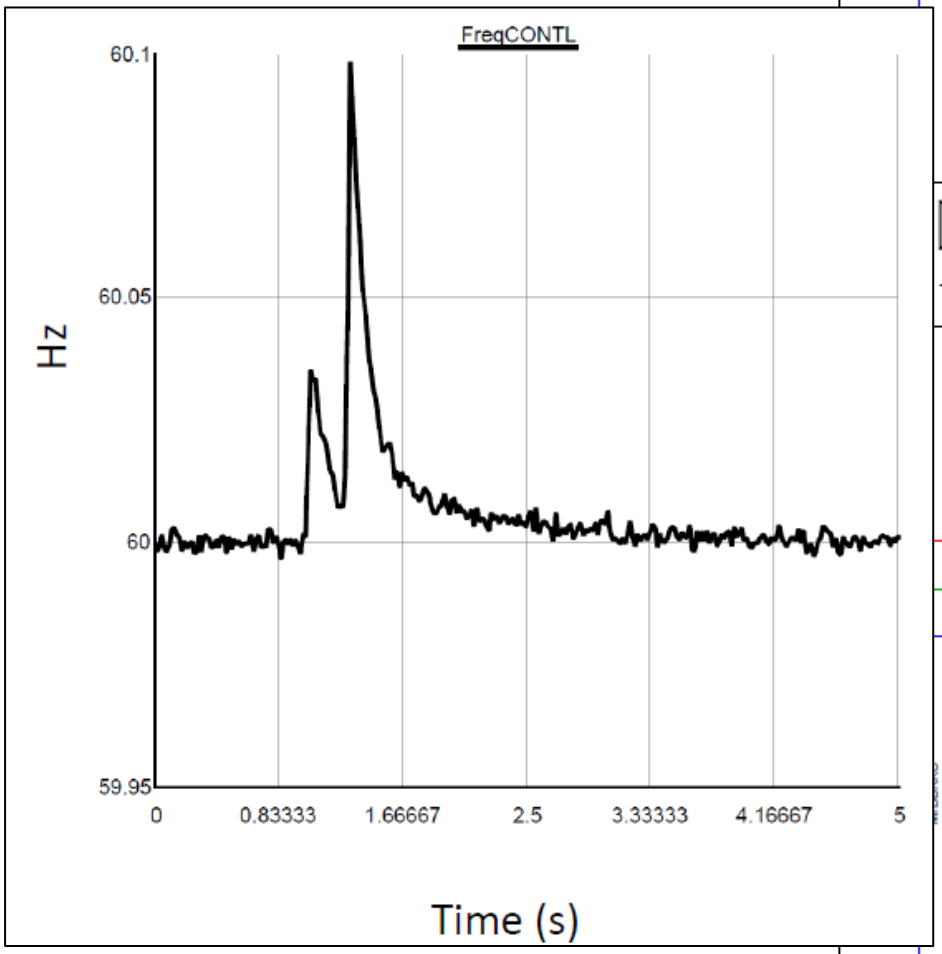
- Controls Integration

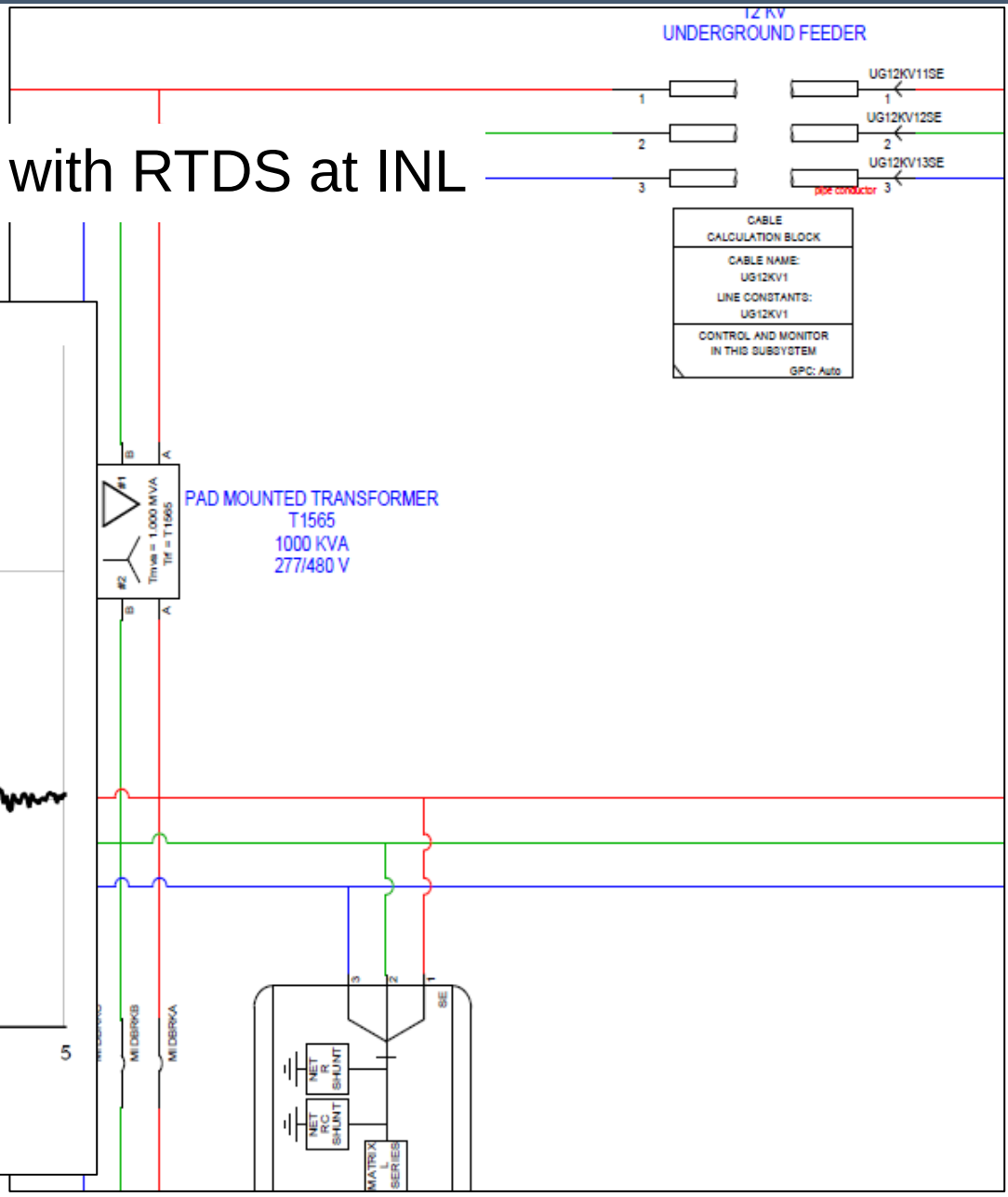
BLR Microgrid Data Flow Diagram:
Revision: 01.2
Revision Date: 5/10/2016
Revision Notes:
Added connection from weather repository to internet



Implementation

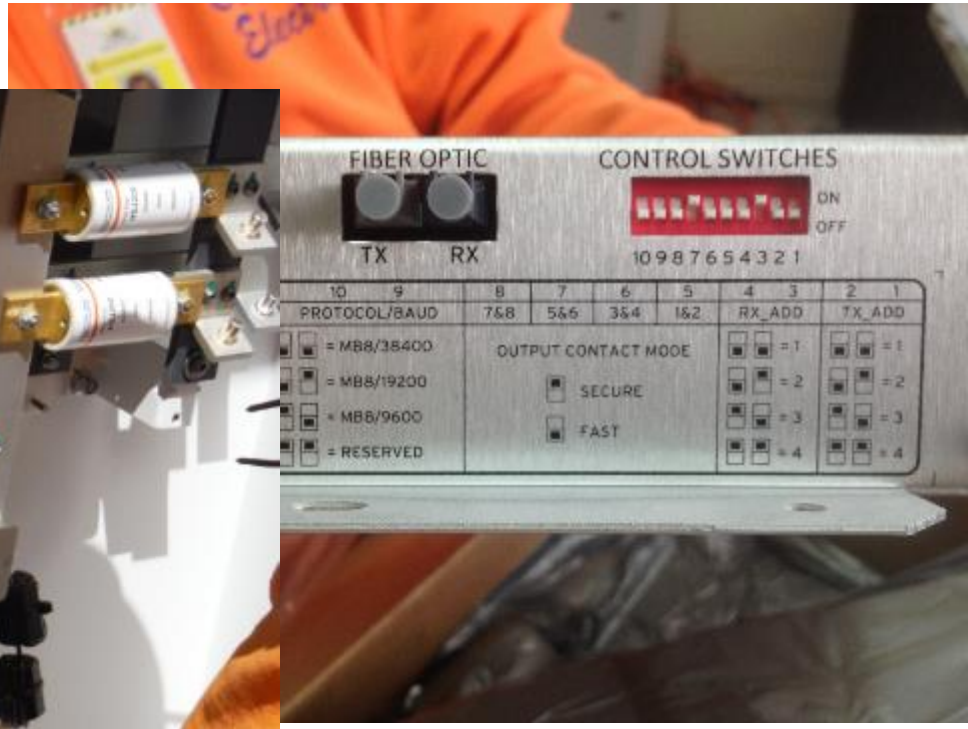
- De-risking with HIL testing with RTDS at INL





Implementation

- Construction Observation and Support



Implementation

- Construction Observation and Support

Microgrid Value & Metrics

- Provide back-up power for a nationally recognized Red Cross disaster shelter
- Reduce energy costs (energy and demand charges)
- Provide demand response capabilities
- Increase the use of local renewable energy sources and reduce GHG emissions
- Provide greater energy security by reducing impacts of energy price volatility and improving energy reliability
- Reduce stresses on the local utility grid via peak shaving and demand response capability
- Project benefits (customer, utility/rate payer, society) will be measured and evaluated

Source: Siemens

Lessons Learned

- Microgrids are cutting edge technology – hardware and software solutions from leading companies are not yet “off-the-shelf.” This can make design work and system integration across multiple vendors challenging.
- Integrating communication protocols & interfaces between components is complicated.
- Standardization and an integrated system approach could eliminate redundancy across multiple controllers and provide cost savings.
- Microgrid inverters must have hybrid capabilities. Need grid-connected anti-islanding protection as well as ability to disable anti-islanding feature when in island mode. There is limited availability of hybrid inverters designed for microgrid applications.
- Microgrid stability is a challenge in a low inertia environment.
- Paralleling an isochronous generator with other generators on the microgrid is challenging.
- Interconnecting parallel generation ≥ 1-MW requires a telemetering SCADA switch; this adds substantial cost.
- Navigating/coordinating the interconnection process with multiple vendors, contractors and PG&E is challenging.

Thank you


CELEBRATING CLEAN ENERGY
AND CLIMATE ACTION
Announcing a New Project (in operation 2016):
• Low-carbon Community Microgrid
• Humboldt County's Largest Solar Array
• Almost 1 MW of battery storage